

Developing the Quality of Mathematics Education to Improve Students' Mathematical Ability

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ABSTRACT

Learning represents a fundamental aspect of the educational process. The efficacy of the learning process is a key determinant of the extent to which educational objectives are achieved. Similarly, the quality of mathematical learning is a significant predictor of success in mathematics. The objective of this thesis is to examine the potential of managerial strategies to enhance the quality of mathematics learning. This research employs a qualitative methodology, specifically a case study design. Data were collected through in-depth interviews. The data sources, or resource persons, were selected using the snowball technique. The data were validated through the triangulation technique. The results demonstrated that: (1) The management of improvements to the quality of mathematics learning is conducted in three stages: planning, implementation, and assessment. (2) Teachers employ various strategies to enhance mathematics learning outcomes, including the provision of structured assignments. (3) The effective management of learning outcomes is contingent upon three key supporting factors: parental involvement, access to learning resources, and the principal's leadership model. (4) Persistent challenges, such as the pervasive belief that mathematics is inherently challenging and student motivation, must also be addressed.

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1. INTRODUCTION

Mathematics is taught at all levels of education in this world. It is the queen and servant of science. Mathematics is called the queen of science because it is the source for other sciences. Many branches of knowledge are developed from mathematical concepts. Mathematics, as a servant of science, grows and develops for itself as a science and as a service provider for the development of other sciences (Rosal et al., 2024)

The acquisition of mathematical knowledge is an essential component of academic development. The development of academic ability is one of the key outcomes of the educational process. Mathematics learning serves to refine and enhance students' academic abilities. The advancement of this academic ability, among others, is achieved through the enhancement of skills. (V et al., 2024). These skills enable learners to comprehend, reason logically, recognize negative examples, apply deductive and inductive reasoning, think systematically and consistently, draw conclusions, determine methods and justify their choices, and identify strategies. In light of these considerations, it becomes evident that the praxis of education assumes great importance in the context of national development. (Dahshan & Galanti, 2024)

The implementation of quality education, in particular, represents a crucial demand that must be met. The failure to implement quality education, on the other hand, can have adverse consequences for the progress of a nation. Each educational unit, or school, is expected to contribute to the larger "project" of developing the intellectual capacity of the nation. Through the implementation of an effective educational system, each school is expected to serve as a leading institution in achieving this noble goal. Each school is expected to provide the highest quality of educational services to its students. The implementation of an effective educational process is expected to facilitate the development of students into individuals who possess a multifaceted intelligence, encompassing intellectual, emotional, social, spiritual, and practical capabilities. This is the primary objective of every educational institution. (Imran & Almusharraf, 2024)

Muhammadiyah 2 Depok Junior High School is an educational institution in Depok, Sleman, Jogja that is organized by the government and plays a role in educating the nation. The role is to be performed in accordance with the objective circumstances that exist within this institution. The school community recognizes that this role can only be fulfilled by implementing an effective educational process for students enrolled in the institution. It is recognized that the education process will be optimized when it is supported by a qualified teaching and administrative staff. Consequently, the senior high school is committed to enhancing the quality of its teaching and administrative personnel. It is anticipated that qualified teachers will facilitate quality learning. SMP Muhammadiyah 2 Depok Jogja endeavors to adapt to the evolving demands of contemporary civilization and the rapid advancement of technology. (Boada & Cirino, 2023) The pursuit of contextual and quality learning models is a collective effort, with the entire school community playing a role. Facilities and infrastructure are continually being enhanced, and quality and quantity are being improved to accommodate the ongoing development of students in accordance with universal and national learning goals. This is a firmly held commitment. To realize or achieve these universal learning goals, one of the implemented efforts is to improve the learning system. The learning system is managed in a manner that ensures the quality of learning is consistently high. In other words, SMP Muhammadiyah 2 Depok Jogja employs a management strategy that is designed to enhance the quality of learning. The learning that is organized is continuously improved. (ASTODILLO, 2024)

It is hoped that students will be able to achieve their educational and learning goals to the fullest extent possible through the implementation of quality learning. In the context of quality learning, Muhammadiyah 2 Depok Junior High School continues to encourage teachers to gain a comprehensive understanding of the various aspects, strategies, and constraints associated with the implementation of quality learning. Teachers are encouraged to engage in the design, implementation, and evaluation of learning in alignment with the established principles and rules that govern learning. (Feikes et al., 2022)

This research project focuses on the implementation of management strategies to enhance the quality of mathematics learning in Muhammadiyah 2 Depok Junior High School. The implementation of management strategies to improve the quality of learning is a crucial undertaking that schools must undertake in order to respond effectively to the challenges of change and development, it is essential to implement management strategies that enhance the quality of learning. By doing so, educational institutions can facilitate the optimal development of students' interests, talents, and potential. (Желавський, 2024)

The objective of the research is to achieve the following:

1. Understanding the stages of planning, implementation, and evaluation of mathematics learning in order to enhance its quality.
2. This study aims to identify the strategies employed by teachers at Muhammadiyah 2 Depok Jogja Junior High School to enhance the quality of mathematics education.
3. To identify the factors that facilitate the implementation of management to improve the quality of mathematics learning in Muhammadiyah 2 Depok Junior High School.
4. Identifying the impediments to the implementation of management strategies to enhance the quality of mathematics learning at Muhammadiyah 2 Depok Junior High School in Yogyakarta.

It is anticipated that the findings of this study will inform the following applications:

1. As a means of developing knowledge, particularly in relation to the learning process and its quality.
2. It is anticipated that the findings of this study will prove valuable as a source of input or recommendations for the organization of education, particularly for those responsible for the administration of the Muhammadiyah 2 Depok Junior High School. These recommendations are intended to facilitate the implementation of a quality learning process.
3. Recommendations are made for academics and researchers to provide meaningful references, particularly with regard to the development of the mathematics learning process, which constitutes an integral component of the implementation of education.

2. METHOD

The research approach utilized is a qualitative approach, specifically a case study. A case study is a research approach that aims to maintain the integrity of the object under study. This means that the data collected in the context of a case study is studied as an integrated whole. The research was conducted at SMP Muhammadiyah 2 Depok Jogja. The subjects were selected using the snowball technique, which involved all teachers, students, and parents of students. As this research is qualitative, the data source selection technique used was snowball. This method involves selecting certain data sources from all available sources to gain insight into the research objectives. The technique used was snowball sampling, which involved interviews with the principal and other school members, including math teachers. (Sugiyono., 2019)

The research was conducted through interviews with the principal, teachers, and students regarding the role of the principal in management efforts to improve the quality of mathematics learning.

The data employed in this study are of a qualitative nature, derived from observations and questionnaires. The instruments utilized in this study include the researcher himself. In this capacity, the researcher assumes the roles of planner, data collector, analyst, and reporter. In this study, the researcher assumes a multifaceted role, becoming a primary data collection instrument. To enhance the capabilities of researchers as instruments, researchers endeavor to engage with novel situations to gain experience, subsequently documenting and interviewing multiple individuals to ascertain the outcomes of other conversations. In alignment with the study's objectives and identified issues, data collection was conducted through in-depth interviews. (Nafi'an et al., 2024)

The interview technique employed was that of general instructions, which merely provided an outline of the process and content to be covered, thus ensuring that the planned points were addressed. In-depth interviews were conducted with key informants, namely mathematics subject teachers.

The data analysis technique employed to address the formulated problems in this study is based on the interactive analysis model developed by Miles and Huberman (1994). This interactive analysis technique comprises four components: data collection, data reduction, data presentation, and conclusion drawing or verification. (Asipi et al., 2022)

2.1. Data Collection

In the data collection stage, researchers gathered data in alignment with the research focus. As previously stated, the data collected pertains to the implementation of management strategies to enhance the quality of mathematics learning at SMP Muhammadiyah 2 Depok Jogja, facilitating factors in the learning process, human resources available, physical and non-physical environmental conditions, and constraining factors that influence the implementation at SMP Muhammadiyah 2 Depok Jogja.

2.2. Data Reduction

The process of data reduction, which occurs continuously throughout the research process, entails the selection of preliminary data sets. This selection occurs at various stages, including the creation of summaries, the application of coding techniques, the identification of themes, and the compilation of summaries. The researcher undertook a process of selecting, focusing on simplifying, abstracting, and transforming the initial data set, which was derived from written notes taken during observations and interviews conducted at SMP Muhammadiyah 2 Depok Jogja. This data set encompassed information pertaining to the implementation of management strategies to enhance the quality of mathematics learning, as well as supporting factors, human resources, and constraining factors that influence the implementation of management strategies to improve the quality of mathematics learning at the aforementioned educational institution. The data obtained from SMP Muhammadiyah 2 Depok Jogja is presented in a comprehensive and detailed format in the field report. Subsequently, the field report will undergo a process of reduction, summarization, selection of the primary elements, focus on the crucial aspects, and identification of patterns. This process of data reduction is conducted on an ongoing basis throughout the research process, as required.

2.3. Data Presentation

The presentation of data is the delivery of information based on data that is owned and arranged in a coherent manner so that it is readily comprehensible with respect to an event or action. This may be presented in the form of a narrative text. The data obtained from SMP Muhammadiyah 2 Depok Jogja are presented in a manner that is both coherent and accessible, facilitating comprehension of the actions and events related to the implementation of quality improvement strategies in mathematics education at the aforementioned institution. To validate the data, the researchers employed the technique of prolonged observation, as previously discussed.

2.4. Verification

Verification of research data and drawing conclusions are based on data obtained from various sources. The researchers then draw tentative conclusions while seeking to corroborate or refute the data supporting these conclusions (Miles & Huberman, 1994). As the data set grows through the continuous verification process, the resulting conclusions will become increasingly grounded in the data. In other words, each conclusion is continuously verified during the research process. The conclusions obtained through data analysis serve as a foundation for preparing recommendations and implications. (Asipi et al., 2022)

3. FINDINGS AND DISCUSSION

In light of the aforementioned description, the results or findings of the research can be discussed as follows.

3.1. Management of Mathematics Learning Quality Improvement

The objective of implementing a quality management system for mathematics learning is to facilitate a quality learning process. A quality learning process is defined as an interactive, inspiring, enjoyable, challenging, and motivating experience that encourages students to actively engage in the

learning process and provides sufficient space for initiative, creativity, and independence. (Ilmi et al., 2024)

Mulyasa posits that quality learning is characterized by three key elements: an increase in student learning activities and creativity, an increase in student learning discipline, and an increase in student learning motivation. In order to achieve quality learning in mathematics, it is essential to plan the learning process and assess the results of that learning. (Ilyas & Armizi, 2020)

The planning of the mathematics learning process

The mathematics learning planning model at SMP Muhammadiyah 2 Depok, Jogja is based on the mathematics syllabus model, which comprises the following elements, at a minimum:

1. Learning objectives
2. Learning material
3. Teaching Method
4. Learning resources
5. Assessment of Learning Outcomes

Moreover, the syllabus model serves as a point of reference for mathematics educators in the preparation of mathematics learning program plans, which encompass AMP, annual/semester program, lesson unit program (Satpel), teaching plan program (PRP), weekly teacher program, and student worksheets (LKS). The overarching planning of the mathematics learning process is oriented towards the nature and characteristics of school mathematics learning.

The implementation of the mathematics learning process

The essence of learning is the interaction between students and their environment, resulting in behavioral changes that are conducive to learning. The implementation of the mathematics learning process aligns with the guidelines set forth in the National Education Standards. In general, the implementation of the mathematics learning process encompasses the following:

1. Implement pedagogical strategies or approaches that facilitate active and creative student engagement, enhance learning discipline, and cultivate intrinsic motivation.
2. Conduct an assessment of learning outcomes.
3. Conduct a comprehensive analysis of the test results.
4. Implementation of improvement and enrichment programs
5. Develop and collate worksheets for mathematics subjects. (Suryani Putri, 2023)

The assessment of learning outcomes in mathematics

The assessment is conducted for the purpose of determining the level of achievement of student competencies, measuring student growth and development, determining learning outcomes, diagnosing student learning difficulties, determining curriculum achievement, encouraging students to learn, and encouraging teachers to teach effectively. The implementation of mathematics learning assessment at SMP Muhammadiyah 2 Depok Jogja is carried out as an integral part of the mathematics learning process. Assessment is an inherent component of the learning process in mathematics. The assessment techniques used are written tests, observations, practical tests, and assignments, both individually and in groups. The emphasis in the assessment is on process skills and accuracy in calculating. This assessment is always based on the nature and characteristics of mathematics. (Lestariani et al., 2018)

3.2. Teachers' Efforts or Strategies to Enhance the Quality of Mathematics Learning

The hallmarks of a quality learning process are as follows. Quality learning is an interactive process that is inspiring, enjoyable, challenging, and motivating for students, encouraging active participation and providing sufficient space for initiative, creativity, and independence in accordance

with the students' talents, interests, and developmental needs. To realize and/or improve the quality of learning as described above, the efforts or strategies implemented in learning mathematics are:

1. The provision of questions
2. The provision of structured assignments and projects.
3. Providing opportunities for students to present their work.
4. Discussion
5. Provide opportunities for students to pose questions or formulate inquiries.
6. The utilization of media in the teaching process
7. It is imperative to make the teaching process enjoyable. It is erroneous to view mathematics as a "scourge," a frightening or intimidating subject.
8. Awarding prizes
9. Provide games, puzzles, and quizzes.

It is anticipated that through these efforts, students' activities and creativity, discipline, and motivation to learn will continue to increase over time, and that their enthusiasm for learning will continue to grow and their interest in learning mathematics will flourish. Consequently, it can be expected that gradually, the perception that learning mathematics is challenging and intimidating will be replaced by a more positive outlook.

Supporting Factors for the Implementation of Management to Improve the Quality of Mathematics Learning

Three factors underpin the implementation of management strategies to enhance the quality of mathematics learning.

1. Parental Support: In general, parents serve as their children's primary source of motivation, often facilitating opportunities for additional tutoring provided by the teacher. This encouragement is further manifested in parents' willingness to enroll their children in extra lessons offered by the teacher, a decision that has led to a notable improvement in mathematics performance at the national level. This upward trend has been observed in the average yearly scores, which have surpassed those of English and Indonesian.
2. Learning Facilities. While the learning facilities may not meet the optimal standards, they are regarded as a significant asset for both students and teachers. For students, the accessible mathematics learning facilities facilitate comprehension of the material. For teachers, the available facilities enhance the efficiency of material delivery.
3. The role of the school principal is to oversee the implementation of management strategies designed to enhance the quality of mathematics learning. In this case, the principal plays a supportive role in efforts to improve the quality of mathematics learning, due to the leadership model that has been developed. The principal develops or implements a democratic and visionary leadership model. The principal provides encouragement for the advancement of mathematics learning, manifesting this encouragement in various ways. These include inviting dialogue with teachers, being open to receiving input, facilitating improvements in teacher quality, listening to complaints, and so on. The principal has the perception that students must master mathematics well, even though they are madrasa students.

Constraints on the Implementation of Management Strategies to Enhance the Quality of Mathematics Learning

The impediments to the implementation of management strategies to enhance the quality of mathematics learning encompass a dearth of facilities, a paucity of motivation, an absence of proficiency in the material provided, and a pervasive assumption that mathematics is inherently challenging.

1. Insufficient facilities.

As stated by the mathematics teacher, learning facilities are instrumental in enabling students to comprehend the material provided and must be mastered. However, the existing mathematics learning facilities are inadequate. The available facilities are not commensurate with the number of students.

2. Lack of motivation among the students.

It is evident that motivation plays a pivotal role in the efficacy of the educational or learning process. In the absence of motivation or a lack thereof, the attainment of learning objectives may not be optimal. A deficiency in motivation often manifests as diminished engagement in the learning process and a decline in learning discipline. Consequently, the anticipated quality of mathematics learning may not be achieved.

3. A lack of mastery of previously given material results in confusion.

This, in turn, has led to a slight disruption in the balance of mathematical learning. The organization of the material, progressing from simple to complex and from concrete to more abstract, is somewhat disrupted. The prevalent assumption among students that mathematics is inherently difficult contributes to low levels of interest and enthusiasm for learning mathematics. In some cases, mathematics is even perceived as a burden. This phenomenon aligns with Jaworski's assertion that the difficulty of learning mathematics is reflected in the evidence that students face challenges in mastering the subject.

4. CONCLUSION

The enhancement of mathematical education quality occurs in three stages. The process of enhancing the quality of mathematics learning is conducted in three distinct phases: the planning stage, the implementation stage and the assessment stage. The focus of this process, particularly during the implementation stage, is on fostering an engaging, inspiring and challenging learning experience. This entails creating an atmosphere conducive to students' active engagement, encouraging them to take the initiative, express creativity, and exercise independence. Ultimately, this learning process aims to enable students to not only comprehend the essential nature, characteristics, and objectives of mathematical learning but also perceive mathematics as a multifaceted activity encompassing the exploration of patterns and relationships. Mathematics as a creative discipline that necessitates imagination, institutions, and discovery, mathematics as a problem-solving activity, and mathematics as a means of communicating with the times. To achieve quality mathematics learning, educators must implement nine key strategies. These include: (1) consistently posing questions in every lesson, (2) assigning structured assignments or homework, and (3) providing students with opportunities to showcase their work, (4) Discussion, and (5) the provision of opportunities for students to pose questions or formulate problems, (6) The use of media in learning, (7) the incorporation of enjoyable activities into the teaching process to make mathematics less intimidating, (8) the distribution of gifts, and (9) the incorporation of games, puzzles, and quizzes. Three factors facilitate the implementation of management strategies to enhance the quality of mathematics learning. These include parental support, the availability of learning facilities, and principals who exemplify democratic and visionary leadership models. Four obstacles impede the implementation of management strategies to enhance mathematics learning quality. These include: (1) inadequate facilities, (2) insufficient student motivation, (3) the assumption that mathematics learning is challenging, and (4) a lack of comprehension of the taught material, (4) A lack of mastery of the material that has been provided.

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